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Farmnote

Tolerance of plants to salty water

By Officers of Agriculture Western Australia and the Chemistry Centre of Western Australia

The total amount of minerals in solution in water - the total soluble salts - mainly determines the suitability of water for crop irrigation or garden use. Other criteria are generally of secondary importance.

The types of salts in water are mainly common salt (sodium chloride), calcium and magnesium bicarbonates, chlorides and sulfates. In the agricultural areas of the State, about three-quarters of the total soluble salt is common salt - a ratio similar to sea-water. This ratio may vary in some coastal and pastoral areas.

When the total salts in a water supply exceed the limits for various uses, only practical tests will show whether the water can be used without ill-effects. Certain conditions may alter the recommended limits.

Results of analysis

Total soluble salts are usually measured by the electrical conductivity of the water and are quoted as millisiemens per metre (mS/m). Multiply the conductivity (in mS/m) by 5.5 to convert approximately to milligrams per litre (mg/L) or parts per million (ppm). Multiply the conductivity by 0.385 to convert approximately to the old unit, grains per gallon.

Water quality for irrigation

The suitability of water for irrigation and home gardens is influenced not only by the total soluble salts and their composition, but also by the type of soil and drainage, the climate and the rainfall. A salt problem is often caused by the salts from the irrigation water accumulating in the soil.

The recommendations provided are only a guide. If the salinity is near the upper limit, the suitability of the water can only be proved by trying it. Preliminary trials are also necessary where there are special conditions of drainage, soil or rainfall.

Seedlings are more sensitive to salt than mature plants. In salty situations, it may help to grow seedlings using good soil in containers that rot when the plants are placed in their permanent positions.

Saline water can be used more successfully on a well-drained light soil than on a poorly-drained heavy soil, and also in districts where high seasonal rainfall leaches the salts accumulated in the soil. Trickle irrigation can reduce the effects of salinity by maintaining a continuously moist soil around the plant roots and providing steady leaching of salt to the edge of the wetted zone.

It is important to reduce evaporation if using saline water for sprinkler irrigation. Water at night, early in the morning or late evening when the air is more humid. Watering in the heat of the day concentrates the salts, due to the high evaporation.

Watering during high winds also concentrates salts.

Do not use sprinklers that produce fine droplets. Avoid intermittent (knocker type) sprinklers if possible - especially slow revolution sprinklers - which allow drying periods, causing salt to build up on the leaves.

Generally, 635 mS/m (or 3500 mg/L) of total salts is regarded as the maximum for safe watering of any plants. With this salt content, drainage must be excellent and each watering should apply enough water to leach accumulated salts below the roots of plants. Keep the water off the leaves to avoid burning.

Where irrigation is infrequent or only for short periods during the year, more saline water may be used.

When watering with saline water, closely observe the growth and condition of plants or herbage. Saline water can cause considerable yield loss before symptoms of leaf burn become obvious.

Iron

Many underground waters contain iron. Water containing iron in solution may be clear and colourless when first drawn, but become cloudy and eventually deposit reddish-brown hydrated iron oxide after standing in contact with the air.

Iron in water stains clothes, buildings and paths brown when used in sprinklers on nearby gardens, and can be a problem with sprinkler irrigation of fruit trees and nursery plants. Iron deposits may block trickle irrigation systems - see Farmnote No. 43/92 'Iron in water for micro-irrigation' (Agdex 566).

There is no simple method of removing iron, so garden irrigation sprinklers should be sited to prevent spraying buildings and places where the stain might be conspicuous.

For small scale uses, iron can be removed by aeration and settling. Farmnote No. 72/99 'Water quality for farm domestic use' (Agdex 582) describes a suitable method.

Important Disclaimer

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Boron

In arid areas, excess boron may be a problem in the garden. If the water supply is considered suitable for the garden yet beans and citrus decline, a check for boron is advisable.

Corrosion of pumps, metallic pipes and tanks

Metallic corrosion increases with the total salt content and the acidity of a water. To assess the corrosiveness of water, particularly underground water, special techniques are required to make sure that the sample is obtained without loss of dissolved gases.

Before taking samples, always seek advice on these techniques and on the timing of submission of samples for analysis from the Chemistry Centre of Western Australia [telephone (08) 9222 3177].

The only method to reduce corrosion by underground water is to use resistant materials, such as plastic piping and protective coatings on tanks, and bronze or stainless steel for pumps.

Samples for analysis of salt content

Any district office of Agriculture Western Australia will analyse water for the total salt content. A fee for this service is charged in most circumstances.

Samples should be at least 500 mL in a clear glass or plastic bottle, previously well rinsed with the water to be sampled. Use a clean screw cap, cork or stopper to seal the bottle, and mark the bottle itself with the sender's name and address, and the date of sampling.

Table 1. Tolerance of common plants to total salts in irrigated water

Plants are arranged in approximate order to salt tolerance in each group with the least tolerant listed first. The difference between two or three plants near one another in each row is small. The plant and water groups are only a general guide. Soil texture and drainage could be overriding factors. Plants listed as suitable for salty waters will nevertheless grow better with less salty water.

Water group and conductivity	Precautions for irrigation use	Group	Suggested plants
A 0–90 mS/m	1. Avoid wetting leaves on hot dry days	Highly salt-sensitive plants	**Pastures:** Ladino clover, red clover, alsike clover, white clover **Fruit:** Persimmon, passionfruit, strawberry, raspberry, avocado, loquat, almond, stone fruit, citrus fruit, apples, pears **Vegetables:** Green beans, parsnips, celery, radish, squash, peas, onion, carrot. **Ornamentals:** Primula, gardenia, star jasmine, begonia, rose, azalea, camellia, ivy, magnolia, fuchsia
B conductivity 90–270 mS/m	1. Avoid wetting leaves during daytime 2. Avoid light frequent waterings 3. Water quickly and use continuous wetting sprinklers if wetting the leaves	Mildly salt-sensitive plants	**Pastures and fodders:** Strawberry clover, maize, lovegrass, cocksfoot, oats (hay), wheat (hay), rye (hay), lucerne **Fruit:** Mulberry, grape **Vegetables:** Cucumber, capsicum, lettuce, sweet corn, rock melon, potatoes, cauliflower, cabbage, water melon, broccoli, pumpkin, tomato **Ornamentals:** Hibiscus, geranium, gladiolus, bauhinia, zinnia, aster, poinsettia, lantana, *Thuja orientalis*, hop bush, (*Dodonea attenuata*) banana (*Musa*), emu bush (*Podocarpus*), *Juniperus chinensis*, *Callistemon viminalis*
C conductivity 270–635 mS/m	1. Avoid wetting leaves of most plants where possible 2. Adequate leaching necessary	Slightly salt-sensitive plants	**Pastures and fodders:** *Paspalum dilatatum*, birdsfoot trefoil, phalaris, sudan grass, perennial ryegrass, millet, annual ryegrass, barley, pangola grass, tall fescue, rhodes grass, kikuyu, couch grass, tall wheat grass **Fruit:** Olive, fig, pomegranate **Vegetables:** spinach, asparagus, kale, garden beets **Ornamentals:** Stock, chrysanthemum, carnation, oleander, rosemary, bougainvillea, vinca, coprosma, *Ficus* spp., false acacia (*Robinia pseudoacacia*), Queensland pyramid tree (*Lagunaria patersonii*), NZ christmas bush (*Metrosideros tomentosa*), Bangalay (*Eucalyptus botryoides*), river red gum (*E. camaldulensis*), Rottnest teatree (*Melaleuca cupressiformis*), Rottnest cyprus (*Callitris robusta*), *Acacia longifolia*, buffalo grass, kikuyu grass, portulaca, mesembryanthemum, boobialla (*Myoporum acuminatum*), morrel (*E. oleosa*), swamp yate (*E. occidentalis*), York gum (*E. loxophleba*), swamp mallet (*E. spathulata*), couch grass, bamboo, Kondinin blackbutt (*E. kondininensis*), native pine (*Actinostrobus pyrimidalis*)
D conductivity 635–2365 mS/m	1. Where possible, do not wet leaves 2. Excellent drainage and leaching essential	Salt tolerant plants	**Pastures:** Saltwater couch (*Paspalum vaginatum*), puccinellia, sand couch (*Sporobolus virginicus*) **Fruit:** Date palm **Ornamentals:** Canary palm (*Phoenix canariensis*), salt river gum (*E. sargentii*), saltwater couch, *Melaleuca thyoides*, salt sheoaks (*Allocasuarina cristata* and *A. glauca*), tamarisks, saltbushes

* Under average conditions the precautions listed should enable satisfactory growth of the suggested plants. Yield of virtually all plants would be progressively reduced as saltier waters are used

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